

Name \_\_\_\_\_

AP Chemistry

## Activation Energy Practice Problems

- 1) A certain first-order reaction has a rate constant of  $2.75 \times 10^{-2} \text{ s}^{-1}$  at  $20^\circ\text{C}$ . What is the value of  $k$  at  $60^\circ\text{C}$  if
- (a)  $E_a = 75.5 \text{ kJ/mol}$ ?  
(b)  $E_a = 105 \text{ kJ/mol}$ ?
- 2) Understanding the high temperature behavior of nitrogen oxides is essential for controlling pollution generated in automobile engines. The decomposition of nitric oxide (NO) to  $\text{N}_2$  and  $\text{O}_2$  is second order with a rate constant of  $0.0796 \text{ M}^{-1}\cdot\text{s}^{-1}$  at  $737^\circ\text{C}$  and  $0.0815 \text{ M}^{-1}\cdot\text{s}^{-1}$  at  $947^\circ\text{C}$ . Calculate the activation energy for the reaction.
- 3) The temperature dependence of the rate constant for the reaction is tabulated as follows:

Temperature (K)	$k (\text{M}^{-1}\cdot\text{s}^{-1})$
600	0.028
650	0.22
700	1.3
750	6.0
800	23

Calculate  $E_a$ .